

U.S. Military Portable Radios

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This is the story, as best I can tell it, of the progress that the U.S. Military has made over the past sixty+ years in mainstream portable voice communications (transmit and receive) radios, with a concentration on the later, more convenient-to-use units (i.e. SCR-536/BC-611 and later, SCR-300/BC-1000 and later, i.e. units with integral battery packs). For completeness, there is a summary of earlier concepts in portable radio design on page 5. A "Portable" is defined as a unit capable of being operated while a person is in motion. Mainstream is defined as having reached some fair production level. Not included in this discussion are clandestine radios (see reference 19), and only passing reference is made to code sending units/beacons. Satellite communication units (SATCOM is datacom only, i.e. e-mail, maps, etc.) are discussed in a separate section since it would appear that these units have LOS (line of sight) capability as well. Also included below is some information on non-mainstream products. The reader should note that this is a list of "what was" with some information on the "why and wherefore." Not generally included here is information relating to the success or failure of the individual radios in their intended application.

In any work such as this, there is a tendency to pigeonhole items in an attempt to organize and simplify. This, plus the fact that one is always working with incomplete information, may lead to some inaccuracies. If you find something with which you do not agree, or if you have something to add, please contact me at atasker@ix.netcom.com.

If you are unfamiliar with military nomenclature, you might want to visit references 6 and 12 first.

Pictures for many of these radios appear in various web sites, and these are so indicated in the "Sources" section.

General Goals

In general, the goals in the development of new radios were, for many years, as follows (some of which are interdependent with, and some of which are contrary to, some of the others).

- Lower Power Consumption
- Smaller Size/Lighter Weight
- Wider Frequency Coverage
- Closer Channel Spacing
- Synthesized Frequency Operation
- Higher Reliability

In more recent years, additional goals have been imposed.

- Internal anti-jam, i.e. Frequency Hopping
- Internal Comsec (ICOM), i.e. voice scrambling
- Data send/receive capability along with voice

In addition, there has sometimes been at least a perceived need to develop radios that operate within more than one band (i.e. the AN/PRC-70, 113, 117D/E/F, 128, 138, 139, and the AN/URC-100/200 series). These radios help "interoperability" with other fighting force elements, as well as communications with local civilian elements such as police and fire when they exist.

The Simple Six

One can group the types of portable radios the Military buys into the following six categories, four of which are tactical and two of which are non-tactical. Not every service purchases all types, nor are all types procured in the same quantities.

- Tactical
 1. The Squad Radio, VHF FM (wide band US, narrow band in Europe), a small hand held unit for very local communications within ground forces. Also included here are sets originally intended to be used by paratroopers.
 2. The main ground force communications device, a VHF FM (wide band US, narrow band in Europe) backpack, for longer distance communications than the squad radio can provide.
 3. An FAC (Forward Air Controller) radio, generally a backpack, UHF or UHF/VHF AM for communications with aircraft and/or with SATCOM capability.
 4. A Special Forces radio, HF SSB, backpack/manpack, for longer distance communications than can be provided by the VHF Backpack.
- Non-Tactical
 5. SAR (Search and Rescue) radios for downed airmen or other rescue duties, originally on 140.58 MHz (for voice, other frequencies being available for MCW), then 121.5 MHz, then 243 MHz only, then multi channel UHF, all AM, and now with 406 MHz coded burst transmissions added for better satellite tracking.
 6. Guard Duty/Fire Rescue/Other Use types, generally Low band (30-50 MHz) or High Band (152-174 MHz), or UHF (450-470 or 512 MHz), and/or the closely associated Government frequencies, narrow band FM.

The Charts

The seven charts along with the introductory paragraphs for each summarize these six types of portable radio sets from the beginning (just before World War II) to the present. Your comments are welcome and are encouraged.

Recent Trends, Program Management Lead

In recent years, certain trends have been evident. For instance, the Air Force and Army have tended to collaborate and use the same hardware when both services needed the same function. This can be seen in the charts, especially in SAR and non-tactical radio usage. Other trends are as follows.

- The Army has been the Lead in the Squad radio, although the Navy/Marines have contributed heavily.
- The Army is also the Lead in the VHF backpack area.
- The Air Force has traditionally been the Lead in the UHF FAC area with the Navy and Army tending to use what was developed. The notable exception is the PRC-75, which was developed for the Marines only. Additionally, there is little evidence to suggest that the Army has had a need for a UHF FAC radio later in time than the PRC-41 era (although they could very well have them, there is no evidence to that I can find to show what they have).
- The Army generally Leads the effort in HF radio development.
- The Air force is currently the Lead in SAR system development.
- The Air Force is the Lead in the Scope Shield program, which is essentially non-tactical, although the Army has the PRC-127 project.

The Beginning Steps in Ground Force Portable Radios, Pre WWII-Chart 2

The style developed in the beginning (battery on the bottom, rigid antenna on the top center or side, front panel controls) was employed for the SCR-194 (Artillery) and SCR-195 (Infantry) for the Army and the TBY for the Navy. These were not really hand held devices, but were intended for backpack use, although they were not built like the backpacks with which we are familiar today. Operating in VHF AM mode, they enjoyed some measure of success.

The Squad Radio, WWII to Present-Chart 1

The first units developed that more or less conform to our present day expectations for handheld devices were the SCR-511 and the SCR-536. The SCR-511/BC-745 (HF-AM) was designed to be used while riding a horse. However, the cavalry was abolished at the beginning of WW II, so it would seem it was a bit awkward to use on foot. It was, however, a marvelous example of good applied engineering, i.e. how to design a radio that was operable with just one hand while riding.

Nevertheless, the honor must go to the SCR-536/BC-611 (along with the SCR-585/BC-721 glider version) paratrooper sets for being the first true handheld transceiver. (All of the above units were made, in the beginning, by Galvin Mfg. Co, which is now Motorola.) Packing a wallop of 36 mW of Tx power, and subject to all the interference the HF AM band musters, it was still more or less a success. The Navy's MAB and DAV paratrooper sets were also fairly small units that operated in the same AM frequency band, but were not quite handheld. Instead, they were what we might call "shoulder strap" radios, a style that has, overtime, not been too prevalent here in the US.

The Korean War vintage PRC-6 (although there is some debate as to whether it made it through development and production in time to actually see wartime service), making use of the relatively new sub-miniature (pencil sized) tubes, improved greatly on the SCR-536. A VHF-FM unit (all tactical radios after this were VHF-FM) with 250-mW output, the higher frequency of operation and the FM mode of this unit reduced the interfering noise level greatly, which led to a much more useable radio.

After a long and drawn out research effort (basically waiting for transistor and integrated circuit technology to develop), the PRC-68 was produced, a very neat little package indeed. There had been an interim stop at the PRR-9/PRT-4, the first all solid state implementation, but they never really saw much use. The PRC-68 was to prove to be the father of five additional designs, the 68A, 68B, 126, 128, and 136.

The 1" longer PRC-68A followed, which was one of the first microprocessor-controlled units. It allowed random frequency programming, but you had to stay within one of the four sub-bands.

The present unit, the PRC-126 is a PRC-68A with a frequency display and external frequency settability. It is microprocessor controlled and allows more latitude in channel placement than even the PRC-68A because it has an external antenna loading control.

The VHF-FM Backpack Radio, WWII to Present-Charts 2 and 7

By all accounts, the first true backpack, the SCR-300, was a very successful design. It should be noted that when fielded, there was no other radio in its frequency band (40-48 MHz FM), so it communicated with like units only (including the AN/VRC-3 tank mounted version). It was followed by the Korean War vintage (although they may have just missed actual war service) PRC-8, 9, and 10 (Armor, Artillery, and Infantry respectively). Using sub-miniature tubes, these offered wider frequency coverage than before.

The PRC-25 was the first synthesized unit, offered wider yet frequency coverage, and had just one tube (RF power output stage). Over 125,000 were produced. The all solid state but otherwise identical PRC-77 followed, with a large quantity produced as well. Tone squelch (150 Hz) was introduced during this period (i.e. PRC-25 and later).

PRC-77 Clones

Although the PRC-77 design is not perfect, it did mark a milestone. It is an uncomplicated (therefor easy to use) wide frequency coverage all solid state unit that achieved a good reliability record in the field. As a result, there have been a number of manufactures who have built clones of this radio (i.e. uses the same accessories), some offering improvements such as 25 kHz channel spacing, selectable output power, and/or updated circuitry to improve reliability. Some of these companies are listed below. NOTE: Some of these PRC-XXX numbers are not official. Companies sometimes assign their own out of sequence numbers for advertising purposes, especially in trying to promote themselves as having a PRC-77+.

- NAPCO International of Hopkins, MN, which offers,
 - A 25 kHz kit for retrofit into existing PRC-77 units.
 - "HR" modules, i.e. a module set made with fewer parts, thus enhancing reliability. Modules are interchangeable with the old ones.
 - PRC-770, a PRC-77 built with the 25 kHz channel spacing.
- DATRON WORLD COMMUNICATIONS (Datron and Trans World combined), Vista, CA
 - PRC1077. A clear-channel (i.e. no jamming present) replacement for the AN/PRC-77 that has 25 kHz channel spacing, 3 selectable power levels (0.1, 2, or 5W), and 10 preset memory channels. A 50-Watt mobile system is available. Uses same external accessories as the AN/PRC-77.
 - PRC1088. A redesigned version of the Rockwell/Collins MP-83 (PRC-124). 25 kHz channel spacing, 2 and 5 W power outputs, 9 memory channels. Can operate in either single-channel or frequency hopping mode with embedded digital encryption.
 - PRC2100V. 30-88 MHz, 12.5 or 25 kHz channel spacing, 100 memory channels, adjustable RF output to 10W. Proprietary frequency hopping and digital encryption. Embedded GPS. Software-driven radio with menu screens in user native language.
- TADIRAN, Israel
 - PRC-2077 offers 25 kHz channel spacing along with highly updated circuitry.

After the AN/PRC-77

The current backpack unit is the PRC-119 SINGGARS (SINGle Channel Ground and Air Radio System). It has an ability to FH (Frequency Hop) in order to avoid jamming (RT-1439). In addition, the "A" model (RT-1523) is called ICOM (Internal COMsec). Comsec stands for COMMunications SECurity, i.e. voice scrambling in order to prevent intelligent interception of message content by the opposition, or anyone else. This model also sports a much longer battery life.

Meanwhile, there is an improvement program underway that has developed and purchased a small number of trial radios. The following was taken from the Web (reference 18).

"The Single Channel Ground and Airborne Radio System (SINGGARS) SIP (SINGGARS Improvement Program) Compatible Portable Radio, the RT-1753(C)/U, is a compact portable version of the SINGGARS radio. This portable radio will be used along with the Lightweight Internet Controller (LINC) and Dismounted Soldier Unit (DSSU) in TF XXI (Task Force XXI) to support dismounted soldier operations and is designed to operate from a dismounted soldier's vest pouch. The radio replaces the current manpack version of the SINGGARS radio. The portable radio includes all SIP performance enhancements to include additional data mode features, embedded COMSEC, an external RS-232 Data Interface and packet switching for access into the tactical Internet. The radio weighs no more than 5 pounds (with battery and antenna), is approximately 1.9 inches by 10.6 inches in size (with battery) and provides selectable output RF transmit power up to two (2) watts and communication range of 3 to 4 kilometers. The portable radio uses a rechargeable NiCad battery pack. Battery life is

approximately 6 hours. The portable radio shall consist of a portable radio, an antenna, and battery pack.”

Jerk-And-Run

There are a number of instances where the portable RT (Receiver/Transmitter) unit forms the basis of a number of nomenclature systems (i.e. AN/PRC, AN/VRC, AN/GRC, etc.). The RT unit can, for instance, be attached to a vehicular mount that allows it to run on vehicle supplied power. Usually there also exists an associated vehicular mounted amplifier that boosts the transmitter power, and boosts audio power as well in order to drive a speaker. Some of these systems even have a “jerk-and-run” capability, i.e. a quick way to disconnect and turn the RT into a portable again. This “multi use” need has resulted in a philosophy change in data plate nomenclature for the newer radios. For many of them, this plate simply states “RT-xxxx.” It is the application that tells what the “usage” nomenclature is, i.e. PRC, VRC, etc. Examples of this include the following.

RT-1439, RT-1523 for the SINGGARS RT (PRC-119)
RT-1319 for the VHF/UHF LOS RT (PRC-113)
RT-1209 for the HF set (PRC-104)

Older Concepts

In a similar vein, there is an older concept where communication devices that have a “Primary Application” also have a “Secondary Application.” Examples of primary and secondary applications are as follows.

- Mobile use
- Portable use
- Transportable use

Sometimes there was only one use. In any event, all radios shown in the following list could, when attached to the correct backpack (rucksack) frame, and when connected to the correct battery box with the correct cables, turn into a useful portable.

- SCR-510/BC-629, two channel 20-27.9 MHz FM.
- SCR-610/BC-659, two channel, 27-38.9 MHz FM, replaced by
- SCR-619/BC-1335, two channel 27-38.9 MHz FM.
- RT-70/PRC-16, 47-58.4 MHz FM, tunable
- RT-53/TRC-7, 100-156 MHz AM, 2 channel (there may not have been a frame for this one)

Additionally, there is a closely allied type of radio that is almost portable, and is defined as transportable (by one or two men), and must be set up to operate. These are sometimes called packsets or manpacks (Note: “Transportable” was defined slightly differently in WWII.) Some of these have additional applications as discussed above. Examples of these are as follows.

- TBX, 2-5.8 MHz AM/CW, Tunable (Tx optional crystal controlled)
- SCR-178/179/BC-186/187/188, 2-5 MHz AM/CW, tunable
- SCR-288/BC-474, 2.5-6.3 MHz AM/CW, tunable
- SCR-284/BC-654, tunable, 3.8-5.8 MHz AM/CW, replaced by
- SCR-694/BC-1306, tunable, crystal option, 3.8-6.5 MHz AM/CW, replaced by
- RT-77/GRC-9, tunable, crystal option, 2-12 MHz AM/CW, replaced by the RT-671/PRC-47 (see chart 4, a packset even though it has a PRC designation)
- GRC-109 (T-784, R-1004, PP-2684 or 2685), 3-22 MHz CW Tx, AM/CW Rx, 1 channel, more of a clandestine set but mentioned for completeness as it has a military designation
- TRC-2, 2-3.4 MHz AM/CW (RT-12), tunable, crystal option, plus included a BC-1306
- RT-46/TRC-12, 2-12 MHz CW, Tx 1 ch, Rx tunable
- RT-654/TRC-77, 3-8 MHz CW Tx, AM/CW Rx, 6 channels

Alternate Overview

By looking at the development of the portable in the above-mentioned method, certain information concerning the WWII period becomes hidden. This is especially the case for the tactical series of radios that encompass both handheld, shoulder carried, and backpacks. Therefore, if we were to choose, just in this paragraph, to look instead at a timeline and intended application approach, we would make the following observations. This should bring a better perspective to the grand scheme of things in that time period.

- The SCR-194/195 (VHF-AM) artillery and infantry radios, developed in the early to mid 1930s, were in reality obsolete when WWII came. They were, however, used anyway because they were available. Based upon the tube technology available at the time (large tubes numbered with two digits, such as 33 and 67), there is only so much performance that the two tubes for which there was room could yield.
- The WWII (VHF-FM) dual use sets (mobile/ground) mentioned in the above "older concepts" paragraph made use of a smaller tube, but did not necessarily obtain good results. For instance, the not as successful as needed SCR-610 was replaced with the miniature tube designed SCR-619 with much better results.
- The development of the miniature tube led to a series of Paratrooper radios in HF-AM. These included the SCR-536, SCR-585, MAB, and the DAV. The SCR-511 cavalry radio also used these miniature tubes.
- The miniature tube also led to the development of the SCR-300/VRC-3 (infantry/armor), a very successful design in VHF-FM, which turned out to be the forerunner of things to come.
- After the WWII period, the sub-miniature tube, even smaller yet, led to the eventual development of the Korean War vintage PRC-6 (handheld), 8, 9, and 10 (backpacks for the Armor, artillery, and infantry respectively).

The UHF Backpack for FAC (Forward Air Control)-Chart 3

Before the US Military Aircraft Band changed to UHF, it was located in mid VHF, 100-156 MHz. The Navy had a 10 channel portable called the MAW. The Army had a two channel unit called the AN/TRC-7 which, in one of its intended applications, operated as a portable (using the same type of batteries developed for the SCR-300/BC-1000, i.e. BA-70, BA-80).

With the growth of civilian aviation and other services following WW II, there were some revisions made to the frequency band allocations. The US Military Aircraft Band changed to high VHF/low UHF, 225-400 MHz. (It should be noted that foreign countries did not necessarily ever change over to the UHF band, making communications with their aircraft difficult when they were fighting with us.) The first portables to cover this new band were the MAY (Navy) and the AN/PRC-14 (Air Force/Army); both four-channel crystal controlled units. The MAY was a manpack unit, while the PRC-14 consisted of two main parts, a transceiver worn in the front, and a power supply with internal battery worn on the back. They were connected with a cable, and the antenna was mounted on top of the helmet. The synthesized (full band coverage, but in only 100 kHz steps) and partially transistorized PRC-41, another manpack unit, followed the MAY/PRC-14.

There was an effort by the Air Force during the mid 60s to develop prototype FAC units that would operate on all three tactical bands plus VHF Air. Rather than being a single radio with four bands inside, they were actually four separate radios, each with its own battery, fastened together on a frame, but arranged so they could be separated and operated independently if desired. Sylvania developed the PRC-71, while Bendix developed the PRC-72. Some number of units were produced (my guess is about a hundred or so) and tested in Vietnam. They hit the surplus market in the very early 70s, so their short life indicates to me a certain lack of success (too big, too heavy?). Later, there was a definition of a better system, the PRC-82, with the four bands designated PRC-83 through 86. All four radios were to be synthesized (the PRC-72 HF section was the only synthesized unit in the previous efforts, all the others were channelized with 2 to 6

channels). It appears that the PRC-82 venture never proceeded too far either. For completeness, the four parts of each of the above mentioned three radio sets were nomenclatured as follows.

<u>Band</u>	<u>AN/PRC-71</u>	<u>AN/PRC-72</u>	<u>AN/PRC-82</u>
HF-SSB	RT-778/PRC-71	RT-835/PRC-72	AN/PRC-83
VHF-FM	RT-777/PRC-71	RT-836/PRC-72	AN/PRC-84
VHF-AM	RT-776/PRC-71	RT-838/PRC-72	AN/PRC-85
UHF-AM	RT-775/PRC-71	RT-837/PRC-72	AN/PRC-86

The PRC-71 and 72 had very different form factors. The PRC-71 consisted of four identically sized transceivers, each in the form factor we have come to expect in a backpack unit, i.e. like a PRC-8/9/10, 25/77, 74, etc. When put on the ground, either singly or in the group of four, the antennas attached to the front panels, (which were in a horizontal plane, making the antennas vertical). When the group of four were carried in the rucksack (hippack) frame, however, only the two units carried on the top would have vertical antennas (if attached). The two units stacked in the lower section were in a horizontal position and could not be operated, since the antenna, if attached, would have been horizontal.

The PRC-72 had a synthesized HF section. Given the technology of the day, the front panel took up a large area in order to accommodate the frequency selection switches. The three other transceivers were smaller and were identical in size with each other. Unlike the PRC-71, the PRC-72 was not designed to be operated lying on its back. It was, like the GRC-9, etc, designed to sit on its side (bottom) with the front panels facing you in a vertical plane. In the backpack, the HF section was on the bottom and took up the whole width and half the height. The other three units were stacked side by side the slim way, on top of the HF unit. This means the panel markings were rotated 90 degrees from what we are used to so that they could be easily read when configured like this. The antenna connections were not on the front panel, but were on what we normally think of as the side. Thus, when in a backpack, the antennas all were vertical, and the units could be operated.

Next

Next, the Air Force developed the AN/PRC-66B; a conventional backpack mounted unit. The Marines evidently did not want a backpack (perhaps because they envisioned an FAC with a PRC-70 (HF/VHF) or 77 (VHF only) on his back), so they went for a two piece design called the PRC-75. The radio and battery box fit into a two pocket front (belly) mounted canvas harness, and were connected with a cable. Both the 66B and the 75 were all solid state Collins Radio (Iowa, USA for the 75, Toronto, Canada for the 66B) designed units employing transistors, ICs and hybrid circuits to effect as small a size as possible.

Dichotomy

From here on out, development of radios in this frequency band took two different directions. Some incorporated both the civilian and military aircraft bands. Other units were aimed at UHF only, but were configured for dual use, i.e. LOS (line of sight), 25 kHz steps with AM modulation, and SATCOM, 5 kHz steps with FM modulation.

Two Band Radios for FAC Use

Today we have a two-band Navy/Air Force unit, which covers both aircraft communications bands, i.e. 108-136 MHz AM and 225-400 MHz AM, in 25 kHz steps. It allows for Air-band interoperability wherever you are, and with whomever you are working. The first model was the AN/PRC-113 (now called the PRC-113 (V) 1), and it was followed by the newer model AN/PRC-113 (V) 3, which incorporated frequency hopping (Have-Quick Program, part of Pacer Speak).

NATO, particularly concerned with anti-jam technology, has defined SATURN (Second generation Anti-jam Tactical UHF Radio for NATO), which is backward compatible with Have-

Quick and Have-Quick II. Motorola developed the AN/PRC-140 for this application. Its top panel looks very much like the PRC-113 in the only picture I have seen.

LOS/SATCOM Radios (see also radios listed in the "multi-band" discussion below)

These units operate in the 225-400 MHz band in LOS (line of sight) mode (25 kHz steps in simplex mode, AM voice modulation, 2-5 Watt RF output power), or in SATCOM mode (5 kHz steps with Tx to Rx offset, FM, primarily data modulation, 15-30 Watt RF power out). For success in the SATCOM mode, a satellite "dish" style antenna must be employed. Dorne and Margolin have been the manufacturer of choice for many of these. For data communications, there is a seemingly endless array of accessories available, including, but not limited to: ANDVT, PSG-2, 5, UGC-74, GXC-7, UYA-7, UGC-29, CSZ-1, DMDG (OA-8990), etc.

Examples of radios in this series include the following.

AN/PSC-3, An outgrowth of the AN/PSC-1. Cincinnati Electronics.

AN/PSC-5, Spitfire Terminal, a Hughes (Raytheon?) and ViaSat produced follow on to the Magnavox MXF-420 NDI Terminal. It covers 30-88, 108-156, 156-174, and 225-400 MHz in 2.5 kHz steps. Part of the EMUT program (Enhanced Manpack UHF Terminal).

AN/PSC-7, a Cincinnati Electronics designed MST-20 Plus.

HST-4 (Handheld Satellite Terminal?) A product of Cincinnati Electronics, the HST-4A went through improvements as the "B," "C," and now the much improved MST-20 (Miniature Satellite Terminal).

LST-5 (Lightweight Satellite Terminal) A product of Motorola, now up to LST-5E revision (and recently designated AN/PSC-10 I think).

HF Backpacks for the Special Forces-Charts 4 and 7

There is not a lot of information on early HF units, such as the crystal controlled PRC-52, 62 and 64. There is some evidence to suggest that some or most of the PRC-64 units (Delco)(a Special Forces replacement for the GRC-109) were converted to the PRC-64A variant that had an improved interface to the GRA-71 burst keyer (300 WPM)(see references 6 and 17).

It would appear that the first unit to reach widespread use was the partially transistorized (four tubes) synthesized AN/PRC-47. It is actually a two man portable (the second man carried the separate Silver battery in its case, amongst other things) with quite an antenna system for the occasions when a temporary fixed station is called for.

The all-solid state PRC-74 with its variants 74A, 74B and 74C backpack units followed this.

The dual band PRC-70, born out of the PRC-42 research effort, appeared next. It does not appear that it ever completely replaced the PRC-74. It also appears there are still PRC-74 units in the field.

The current HF unit is the IHFR (Improved High Frequency Radio) AN/PRC-104, with variants "A" (changed to LCD readout) and "B" (which added provisions for STAJ, Short Term Anti Jam).

Rumored to be on the horizon is the "Joint Tactical Radio," some information on which is beginning to appear. The term "software radio" seems to be mentioned quite often.

SAR-Rescue Radios-Chart 5, PRC, URC, ICU, UCMe

The Search and Rescue function has produced at least eighteen different radio designs over the years, very prolific indeed. Intended to be packed with life rafts/boats, ejection seats, or, if small enough, with the airman himself, these units were generally powered by Mercury batteries because of the long shelf life of this particular chemistry. However, environmental concerns related to spent battery disposal have led the government to recently ban the further use of Mercury batteries. It looks like Lithium batteries will inherit this role.

Many of these radios have seen service in roles other than SAR. Their small size lends itself to specialized communication duty, as evidenced in many of our conflicts, especially Vietnam.

It should be mentioned here for the purposes of completeness that the first life raft rescue radio was a code-sending transmitter nicknamed the "Gibson Girl." Nomenclatures included the BC-778 (SCR-578) and the AN/CRT-3. At 500 kHz it needed a long antenna, so it was furnished with both a kite and a balloon to loft the long wire. A chemical kit made hydrogen to inflate the balloon.

The Navy's AN/CRC-7 was the first two-way voice radio. Intended for life raft and other uses, it may have been used by the Air Force as well.

While in the midst of the aircraft frequency band plan change (see discussion in FAC section above), there was a need to have the SAR radios cover both 121.5 and 243 MHz. This made the radio rather large and heavy. The Air Force/Army went with the AN/URC-4 while the Navy went with both that and the AN/PRC-17. In a personal interview with a SAC Airman during this time frame, he stated that the mass of the radio was so large, and the jerk of the parachute opening so great, that "the radio and its battery ripped through the vest and kept on going upon chute deployment."

When the switch in frequencies was completed, the Air Force/Army went with the URC-11, while the Navy used them as well, and also developed the PRC-32. Both of these operated on 243 MHz only and were much smaller than their two frequency predecessors. Since they still employed sub-miniature tubes, the battery was still big and heavy, however.

The push for a solid state radio resulted in the URC-10 (just one of many derivatives of the ACR designed RT-10 (243 MHz), such as RT-20A for training, (251.9 MHz), PRC-93 for the Marines (? MHz), the RT-60 (243/282.8 MHz), and the RT-60B (121.5/243)), which saw use by all branches, and the PRC-49 Navy developed unit, which most likely was the first all solid state rescue radio to make it into service. The Navy continued and developed the ultimate in small size...the PRC-63, the cutest little thing you ever did see.

However, the age of single frequency SAR radios had ended. The number of ELT (Emergency Locator Transmitter, sometimes automatically activated upon chute deployment) beacon transmissions crowding the 243 MHz frequency during battle in Vietnam proved the need for a second voice frequency, ultimately chosen to be 282.8 MHz.

The Air Force developed the URC-64 four-channel device. The Army opted instead for the URC-68, a four channel two-band (VHF/UHF) radio for the OV-1 aircraft and for helicopters. It allowed downed airmen to communicate directly with ground troops as well as with aircraft. Both of these were manufactured by Magnavox, and were ultimately replaced by the Navy developed PRC-90, and improved PRC-90-1 and then -2, all of which are two-channel units (243 and 282.8 MHz), the first tri-service SAR radio.

This was followed by a COTS (Commercial Off The Shelf) device from Motorola, the PRC-112. Sporting five different frequencies, circuitry was included which allowed aircraft equipped with the AN/ARS-6 to develop range and bearing information (DME), certainly a great help in aiding rescue efforts.

Current Para-Rescue (in the water, voice or chin activated) radios include the PRC-103 AF unit, a spin off from the PRC-90, and the PRC-125 for the Navy. The current Naval lifeboat radio is the PRC-96. All units mentioned in this paragraph (and maybe even the PRC-106) were first designed by GTE/Sylvania, although most were produced by others, especially after GTE's decision to exit this business segment.

The big news today in SAR is CSEL (Combat Survivor Evader Locator); a new Air Force managed tri-service program being run through Boeing. Racal has the contract for the new radio, which carries the nomenclature AN/PRQ-7. It will be capable of transmitting on at least 121.5, 243, and 406.025 MHz (the COSPAS-SARSAT satellite tracking SAR system). It will also receive GPS information.

As a short-term stopgap, Motorola produced 1000 pieces of an interim solution for use in the hot spots around the globe. It is called the HOOK-112, and it is a PRC-112 with an internal GPS (Global Positioning System) receiver that encrypts location data and transmits it upon demand to the SAR aircraft.

Meanwhile, the Navy is developing two new items on their own, the PRC-149 rescue set, and the AN/URT-140 beacon. Information is just beginning to appear on the web about these items.

Non Tactical Portables-Chart 6

There have been a number of non-tactical portables used over the years. For the most part, these have been commercially available units (i.e. Motorola, Comco, Repco, Bendix, etc.) provisioned by the services for use all over the globe, and operating generally in the NBFM mode within some part of, or all of one of the following bands...30-50 MHz, or 132-174 MHz, or 406-470 MHz. Additional AN/PRC-xxx nomenclatures known to fall in this category are the PRC-23, 24, 29, 39, 46, 55, 56, 58, 59, 61, 97, 101, and 129. Unfortunately, except for the PRC-127, information on this class of portables is sometimes scarce. Some facts have recently become known, however, and the chart will be updated in due time.

The Scope Shield program (AF run tri-service) is an exception. The second effort at providing a radio that would be interoperable with standard commercial frequencies made use of the AN/PRC-126 but changed the circuitry so that either 30-88 or 130-174 MHz could be covered by exchanging modules. This unit is the AN/PRC-128, and is an outgrowth of the early Scope Shield efforts with the PRC-68B (V) low band (the Marines also bought this one for tactical purposes)(10 channels programmable with independent Tx and Rx frequencies if required, 2.5 kHz steps, NB or WB as required) and PRC-68B (V) 2 high band separate radios. (The PRC-136 fire rescue set appears to be another derivative of the PRC-68/126/128 programs.)

The Scope Shield II Program then developed the AN/PRC-139 with Racal. This radio can cover all three bands with module exchange, VHF low, VHF high, and UHF, all NBFM.

Multi Band Portables-Chart 7

There has been a trend to develop, for some applications, portable radios that cover more than one band. This multi-band coverage is, unlike the Scope Shield radios mentioned above, built in; i.e. no module exchange is required. The list is as follows.

Those Including the HF band

- The first was the AN/PRC-70. It covers the HF spectrum (2-30 MHz in SSB, AM) as well as the Tactical VHF frequencies (30-70 MHz FM).
- There was a unit called the PRC-132, offering SSB coverage in the 1.6-50 MHz band.
- Harris' PRC-138 is a more modern type covering these same two bands (1.6-30 in SSB, 20-60 in FM). It is in use by U.N. Land Force Elements.

Those That Are VHF/VHF or VHF/UHF

- The grand daddy of them all is the Motorola developed AN/URC-1xx series. The basic design consists of a fully synthesized 225-400 MHz, AM and FM transceiver with internal hooks to allow a second band to be included by means of a transverter. Chart 7 shows the model numbers that developed out of this design. See especially reference #5. The Army is apparently using some number of the URC-100 for voice and the URC-110 for data (SATCOM). The Navy Seals apparently have some number of URC-110 sets also. The new replacement for this series is the AN/URC-200, which can be ordered with a third band, so that all three can be covered. FEMA has supposedly bought many of these.
- Magnavox developed three dual band units as follows. Like most radio sets developed in recent times, optional components such as mounts, power amplifiers (RF and audio), etc. were available to allow vehicular use.
 - MXF-707-1, 130.000-149.995 MHz with channels spaced at 5kHz, 150.000-173.975 Mhz with channels spaced at 25 kHz, 406.000-419.975 MHz channels spaced at 25 kHz, and 440.000-469.9875 MHz, with channels spaced at 12.5 kHz, FM only.
 - MXF-707-2, 29.5-90 MHz, 130-174 MHz, FM only.
 - MXF-707-3, 116-150, 225-400 MHz, Am only. This eventually became the AN/PRC-113, VHF Air band, and UHF Air band portable.
- Harris expanded on its single band AN/PRC-117/A/B with the following.
 - The PRC-117D, which covers the Tactical VHF (low) band, 30-90 MHz, VHF high band (aircraft and mobile), 116-174 MHz, as well as Tactical UHF (including SATCOM), 225-420 MHz. The Marines and the Seals are apparently using several of these radios.
 - The PRC-117F offers continuous coverage from 30 to 512 MHz.

Special Purpose Portables

Not included in the above discussions are some special purpose portables that were developed for flight deck communications. The following are known to have been, or are suspected of having been used for this purpose.

- PRC-44
- PRC-53, a NAS/Norfolk repackaged PRC-34/36 transceiver into a helmet (38-51 MHz FM, single channel).
- PRC-55, p/o the AN/SRC-22, 132-150.8 MHz, handheld.
- PRC-56, p/o the AN/SRC-22, 132-150.8 MHz, helmet.
- PRC-114, an inter-ship communications system, p/o the AN/SRC-47, 340-390 MHz.

Unknowns

There are many AN/PRC-XYZ numbers unaccounted for. Some of these were concepts that never made it further, while other programs may have made it to the prototype stage. Still others may have been limited fielding trials of a particular device to test it out. In addition, there has been an increasing trend of late where the services will assign different PRC nomenclatures to each entry in the runoff for a particular upcoming procurement. This happened in the Scope Shield II procurement, and may very well have happened in the SINCGARS procurement. The following numbers have appeared on real hardware, but the story behind why remains a mystery to me. Surely, somebody out there knows the story.

- PRC-108, the Sunair model PRC20/6, 2-12 MHz, 6 channel, crystal controlled, 25 W transceiver.
- PRC-116, the Racal Jaguar V, 30-88 MHz ECCM unit, Racal #BC-66H

- PRC-124, a Collins MP-83, a PRC-77 type with 25 kHz channel spacing and FH, now redesigned and being offered by Datron World Communications as the PRC-1088.
- URC-87, the Southcom SC-130D, 2-12 MHz, synthesized transceiver.
- PRC-130, the Southcom SC-140, 2-30 MHz, synthesized in 100 Hz steps transceiver.
- PRC-132, Loral Terracom M50B, 1.6-50 MHz, 50 W portable.
- PRC-133, a 2-30 MHz backpack, version of the GRC-233?

Battery Technology

Where there is a portable, there is a battery. They come in two classes, Primary (use it once and throw it away)(nomenclatured BA-xxx), and Secondary (rechargeable)(nomenclatured BB-xxx). The bottom line is that primary batteries offer longer life per use, but of course, they cannot be recharged.

During WWII, there were only three types of batteries used in portables, Lead Acid rechargeable (for units with vibrator power supplies), Carbon Zinc for most of the rest, or Mercury (rescue radios only). Today, there are a bewildering number of chemistries out there, including but not limited to the following.

- Primary
 - Alkaline, certainly low cost.
 - Magnesium, on the scene until Lithium came along.
 - Lithium/Sulfur Dioxide, the king of the hill for now.
- Secondary
 - Lead Acid, liquid, gel, or starved electrolyte types, old venerable but heavy and has a tendency to sulfate.
 - Silver, stayed for a short time.
 - Nickel-Cadmium, lighter weight but has memory effect, usage is fading.
 - Nickel Metal Hydride, twice the energy density of the NiCad, and with no memory effect, but expensive.
 - Lithium Ion may be coming soon.

The goal is to obtain the highest energy density (watt-hours per unit volume (cubic inches)) at the lowest possible cost. Unfortunately, some of the highest performers are also the most expensive. However, some work over the past few years in Lead Acid technology has shown that proper charging techniques (pulse) can forestall sulfation, the chief cause of failure in this cell chemistry. Apparently, the increase in life can be up to 10 times. For a cash starved Military, this could be a Godsend. One of the unfortunate characteristics of secondary batteries, however, is that most if not all of them have a self discharge rate of 1-3% per day at 25 degrees C, worse as it gets hotter.

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The proceeding is an updated version of a multi-part article that originally appeared in the "Military Collector Group Post"; an international email magazine dedicated to the preservation of history and the equipment that made it. Unlimited circulation of this material is authorized as long as the proper credit to the original author(s) and publisher (or the group) is included. For more information concerning this group or membership, contact Dennis Starks at...

military-radio-guy@juno.com. A list of selected articles of interest to members can be seen at: <http://www.softcom.net/users/buzz/backmail.html>

Or tour the website at <http://mcgp.cellmail.com/>

Comments by Dennis Starks-Note: The above write-up has been changed to accommodate Dennis' comments

From: military-radio-guy@juno.com (Dennis R Starks)

Date: Thursday, 16 Jul 1998 06:45:15 EDT

MILITARY COLLECTOR GROUP POST, July 16/98

US MILITARY PORTABLE RADIOS; PART IV,
Conclusion by Dennis Starks

Forward:

I realize that the author's intent in the first parts of this series was to give a casual account of the development of selected portable radios beginning in WW-II and progressing to the present. However, things being as they are, and me being the ass hole I am, I just couldn't leave it at that. I felt that several things should be covered in more detail, and a couple half-truths

dispelled. It is my sincere hope that further, more detail discussion may be the result of publishing this material. Comments from everybody, regardless of content are most emphatically sought.

In The Beginning,

The SCR-511 was not developed before the SCR-536; in fact, the SCR-536 was undergoing field trials before the SCR-511. As has been covered in great detail via this forum, the two radios were designed with two completely different intended purposes; it was fate that joined them as companions in the field. In addition, the Navy had fielded the MU (early MAB) before the advent of either.

Surely, it can be shown that the Navy has traditionally been far in advance of Army development all throughout radio communications history. Some examples, the Navy had in hand by 1939 the ART-13 (ATC), TCS, TBY, TBX, TBW, MU and the famous Command Sets to name just a few. All far and away more advanced than their Signal Corps counterparts BC-375, BC-223, BC-222, BC-654, BC-191, BC-611, and BC-229/230. It would not be until near wars end that the Signal Corps would catch up to the Navy and in some cases adopt Naval equipment. Similar examples can be shown to the present day. Perhaps a future series of articles entitled "Army Versus Navy" might be in order.

These facts however have been neglected in history, and overshadowed by Army variants for several reasons. First is the secretive nature of the Navy that prevented the commercial propagandizing enjoyed by the Army and its equipment. Second is sheer numbers, while the Marine Corps had by mid WW-II a large selection of excellent equipment to choose from, their operational proximity to Army units by this time, combined by with the greater numbers of Army units and a difference in operational doctrines mandated that they (the Marine Corps) adopt and use those items of Signal Corps equipment most often needed to both enhance compatibility, and simplify the horrendous logistics problems associated with the support of such contingents in the field. Third was the support by manufactures at home. Manufacturing facilities at home were stretched to near limits. Every item needed to support the war effort had to compete for these facilities. The extent of this competition is very difficult to convey, but suffice to say it created extreme tension between ALL the services.

It should also be noted that Army Signal Corps, and Air force development were one in the same thing until the split of the Air force with the Army well after WW-II. Until then the only development or procurement effected by the "Army Air Corps" on it's own and without Signal Corps consent or collaboration was met with later disaster. A case in point was the Air Corps Jefferson Travis field radio sets that were ordered out of defiance without Signal Corps consent. The Jefferson Travis was much like a larger, more powerful SCR-284 (BC-654). Later during the North African Campaign, the Air Corps complained to the Signal Corps about the extreme weight of the radio set, and their difficulties in obtaining support and maintenance items. The Signal Corps replied in effect, this isn't one of our radio's, we did not order, nor approve them, therefore the logistic support channels do no exist in our system, I/E you shit your own nest now lay in it! The Jefferson Travis was then replaced in the field with Signal Corps types that had been designed for that same purpose rather than further clog up the logistic channels trying to support it. The same story can be re-told with several other examples.

FAC Radios,

The Air force lead in the development and use of an FAC radios can be debated in depth. Considering the WW-II developmental practices outlined above, the first true FAC radio was the TRC-7 of mid WW-II vintage, developed for Military intelligence, and Airborne troops (not the Air Corps) as both a liaison radio for air support, and later as a means of fighter control for extreme forward area ground troops. It was indeed a backpack radio operating from the same battery as a BC-1000, and provided with a very large array of accessories that allowed it's use as a semi-fixed station, even a hand crank generator was available. There is also evidence to show that the CRC-7 (the first hand -held VHF AM downed airman's radio) had been used as an expedient by Airborne troops even before the advent of the TRC-7 (more on the CRC-7 later).

The mid-late 50's saw a re-emergence of the TRC-7 in the hands of the Air force. This as a result of the realization that our move to UHF AM for tactical air communications had left the rest of the world behind, thus American FAC teams had no means of communications with allied

aircraft. This condition persisted until the end of US involvement in Vietnam, and a steady succession of radios were either developed or purchased Off-The-Shelf and used as expedients to relieve some of the problem.

Long before the Army/Air Force's fumbling along with the TRC-7, and PRC-14 (late 50's). The Navy had realized a need and solved it by late WW-II. This with the MAY (UHF AM) and the MAW (VHF AM), both these radios were backpack types that could also be set for semi-fixed operation with an elevated antenna. Though grossly obsolete, they would still be in the hands of Marine FAC/Pathfinder units until the late 60's. In the same light, the development of the PRC-41, and PRC-47 can be more closely credited to the Marine Corps who was by far the largest purchaser, rather than the Army or Air force.

It should be noted that FAC operations have the peculiar need to be able to operate on all bands, I/E HF/AM (later SSB), VHF/FM, VHF/AM, and UHF/AM. This led to the Air force's development of the PRC-71, 72, 83 etc. None were built in very significant quantity. The Army and Navy on the other hand chose to stick with an assemblage of the more common tactical sets PRC-25/77, 74, 47(Marines), and 41. In addition, history will show that virtually all the common radios originally developed as Downed Airman's, or survival radios, also saw secondary duty in use as a front line means of fighter control often in the hands of Special Forces Teams, and other Irregular Forces. These include the URC-4, 11, 10, 10A, PRC-63, 90, ACR-RT-10 and a long list of others.

It is true that very little is known of the Pre-SSB days of the front line foot FAC units. We do know that the GRC-9 was used in this capacity while vehicular, and was most probably dismounted for close-in use. The possibility also exists that the GRC-13 might have been used in this same role, and if so, might account for its extreme rarity today. While the Marine Corps did have access to GRC-9's, their TBX series remained in service at least until the end of the Korean War, and evidence exists that place it in use even later. It is very doubtful that either the GRC-109, or the PRC-64, ever saw service in use by FAC units. This because the primary mode for both of these radio sets was CW, and voice communications were needed for spontaneous aircraft tactical coordination. Also the history of the GRC-109/RS-1 in military hands has been well documented via this forum and precludes any such usage. Another contributing factor in the development of FAC equipment is that Air force FAC units, unlike Army FAC's and Marine Pathfinders seldom advanced into the extreme forward areas that would require the use of backpack equipment. Thus, most of the equipment used by them was vehicular in nature. Beginning in WW-II, a tradition of retrofitting aircraft radio equipment into ground vehicles started with the SCR-522, which, after being installed in tanks, was called an SCR-524. This practice mushroomed after WW-II with 24vdc(compatible with 28vdc aircraft) becoming our military's standard vehicle voltage, and still lives on today, the variations of equipment used would fill several volumes, and include HF, VHF, and UHF examples of every type and vintage.

PRT-4/PRR-9/PRC-68,

It is true that there was a long drawn out research effort that resulted in the Marine Corps PRC-68. But this was preceded by an even longer effort to develop the PRT-4/PRR-9, beginning in 1950 and ending in 1964. This effort produced the experimental PRC-15, 30, 34, 35, & 36. While it is true the PRT-4/PRR-9 saw little actual service in the field, it remained the only official squad radio of record until at least 1977, when only experimental versions of the PRC-68 were yet available.

The PRT-4/PRR-9 combination remains extremely significant to history for several reasons. First and foremost was the technology they represented including the first in an all solid state radio set, and second the use of a 10.7mc IF frequency which is now standard, and lastly the first use of an Integrated circuit (IC), this is the 150cps tone generator on "A" models. The story told in the development of these radios is an unequaled example of Government Bull Shit, and non-cooperation.

The PRC-68 was the direct result of the adoption of the PRT-4/PRR-9 and not because of any obvious reasoning. But out of the disgust felt by the Marine Corps having been totally ignored during the entire developmental process even though this was a joint services project. Their grievance was not with the basic design of the radio set, or its performance, rather it was with the dual radio packaging and limited channel capacity. I/E the Marine Corps had all along

pressed for a channel capacity of at least four and a radio housed in a single cabinet. Had their wishes been headed during the Development of the PRT-4/PRR-9, we might not ever have received the PRC-68's, or at least not until a much later date.

In the interim years between the PRT-4/PRR-9 and the PRC-68, another long list of radios were developed, and or purchased as emergency expedients in very limited quantities. Some of the later include some international joint development units such as the PRC-601, and 602 a joint Israeli/US, Tadiran/GTE venture. At least four solid state versions of the PRC-6 are also known to have been purchased by the US government, two types of German origin, and two of US.

Downed Airman's/Survival Radios (SAR),

While there was a succession of survival type radios used before during and after WW-II, the first such radio adopted as a Standard Item was the legendary Gibson Girl of WW-II fame. A direct copy of a German set that had been captured in the North Sea by the British, then remanded by them to the US for development and production. It remained in service aboard large aircraft and all sea going vessels with very little change until the late 80's and the demise of the 500kc marine distress band, combined with the negating of Morse Code proficiency of licensed marine radio operators.

Second to emerge was the CRC-7. While it is true that the radio was used in life raft during the war. It's greatest claim to fame was it's use aboard fighter aircraft where the available space for such equipment was at a premium (the CRC-7 was a transceiver shaped like a large cigar tube, approx. 2" in diameter, & 14" long). In postwar years, it would receive expanded use in light bombers, and with commercial airlines.

The Army/Air force/URC-4 use combined with the Navy/PRC-17 use can be debated to some extent as numerous examples of the URC-4 survive to show Navy use. In addition, most surviving examples of the PRC-17 show use by commercial airlines. Further, the URC-11 /Army/Air Force and PRC-32/Navy associations can also be debated. It would appear that the Naval purchase of the PRC-32 was a simple expedient to augment supplies of their URC-11's at a time when technology was awaiting the advent of an all solid state radio. I/E, a limbo period existed between the URC-11 (all tubes) and the first solid state SAR radio. During this period a long list of Make-Do radios were purchased, tested, or used. Some of these were even commercial Off-the-Shelf types including many ACR built variants. It should be noted that all these early SAR radios (except the CRC-7), even the first and second generation ACR types, used an external, metal incased, battery that was connected to the radio via an umbilical cable, making for a very cumbersome arrangement. The first solid state SAR radio was not the ACR-RT-10, or the URC-10 (both being the same radio). The first model RT-10 was in fact a tube type radio and used a separate battery just as previous designs [**Information from the manuals indicates Dennis is not correct here...in fact, all these three sets were solid state**]. The second version "A" model, though physically identical to it's older brother was indeed all-solid state. It was adopted by all US services with various markings including ACR-RT-10A, URC-10A, and PRC-93 [**It appears there was only an RT-10, no "A" version is known to exist**]. Apparently due to it's high production cost it did not fair well in military service.

The Army's URC-68 was never intended as a one size fits all SAR radio. It was expressly intended for use by helicopter flight crews and with their close operational proximity to ground troops, the low-band VHF/FM band was included. At one time it was briefly considered by the Army Rangers as a "Stop Gap" radio to fill the void they felt for lack of a suitable squad radio. It was however quickly dismissed as too fragile for this type use.

The Navy PRC-63, though it did enjoy some popularity and use, was a hermetically sealed throwaway radio. Built completely from synthetics, it was very light weight, compact, and possibly for the first time in large scale, used a "Rubber Duckie" type antenna. But it's synthetic materials rendered it fragile, and its being permanently sealed prevented any attempt at servicing. It gave way in short order to the PRC-90.

The Navy's improved PRC-90-2. The only difference between the PRC-90s used by the Navy/Marine Corps and those in use by the Army/Air Force was in the process used to manufacture their cabinets. Both radio variants were built in the same factories at the same time, on the same production lines. The difference is in the type aluminum used in the cabinets on

each variant. Those used by the Army/Air Force have an aluminum cabinet that began life as an investment casting. On the other hand, Navy/Marine Corps cabinets are completely milled from a solid block of aluminum. The end result of the Navy/Marine manufacturing process was a radio that would survive being submerged in water to a greater depth.

Even by the late 50's-early 60's, the military had not completely weaned itself from some dependence on the VHF (Civil) aircraft band. The URC-14 is identical in every respect to a URC-11 except for one; it operates on 121.5 vice 243mc. This can be seen again with the current PRC-106, a radio that is physically identical to the PRC-90 except that this one is dual band and operates on both 121.5, and 243mc. Has anyone ever noticed the harmonic relationship between all the aircraft Guard frequencies? We have 40.5mc FM used in helicopters, times three equals 121.5 for the civil aircraft band, time two equals 243mc military guard. Coincidence?

Back-Pack Radios,

The BC-222/322(SCR-194/195) along with the TBY were indeed Backpack radios, and as such designed to be operable while in motion on the operator's back (though admittedly a very precarious operation for these particular radios). Followed by the SCR-300 (BC-1000) which would set the stage for ALL front line tactical radios to follow, even to this day.

The PRC-8, 9, 10, not only offered much greater frequency coverage with less signal bandwidth, and a smaller size and weight. But also introduced the first examples of modular design into a military radio. This greatly simplifying field service and logistics, and provided some measure of interchangeability between radio parts and accessories. The Canadians, Dutch, and Australians would ingeniously expand on this system in their same generation of equipment to include their Squad Radio, the CPRC-26. Which used common components, and accessories with not only their own versions of the PRC-8, 9, & 10, but also US radios. The US would not follow their own lead with our PRC-6, which included none of this interchangeability. Another "First" for the PRC-10 family of radios, and possibly most significant, was their Steel Tape antenna that would become an international standard to this day.

The PRC-25 is the single most significant contribution to military tactical communication of its type since the advent of the SCR-300 (BC-1000). It and its immediate successor the PRC-77 would become the most proliferate radio in military history spanning almost 30 years, 40 countries, and countless manufactures foreign and domestic. It would remain the standard for comparison long after its obsolescence, and still remains in widespread use today. Besides being the first solid state FM backpack radio, it also introduced the now standard 150cps tone squelch system which effectively "Grunt Proofed" it not only simplifying operation by untrained personnel but also reducing front panel controls to a minimum.

The PRC-119 is by ALL accounts, especially those taxed with its operation, a horribly over complicated, and temperamental radio set. I personally cannot perceive its longevity as a replacement for the PRC-77 excepted in higher echelons where communications security is of utmost importance and the personnel that are highly trained for its operation, and support are available.

Multi Role Radio Equipment,

While the concept of a multi role vehicular/manpack radio system is indeed an old one, it still enjoys great popularity today worldwide. And too, while it is true that such radios as the BC-654, 620, 659, 1306, GRC-9, TBX and a host of others, were adapted for use in a vehicular mode. Their primary design intent and purpose in life was as a Field Portable/Man-Pack radio set and not a vehicular one. In the case of the TBX, though, power supplies existed which allowed vehicular use, but no mounting hardware for either the radio or its ancillary equipment were ever produced. Vehicular installation instructions for this particular family of radios amounted to templates by which plywood mounts could be cut.

The reverse is true of such radios as the BC-1335 and RT-70 whose portability was secondary to their primary mission as a vehicular radio.

Special Forces Portables,

It is true that early equipment specifically designed for use by various Special Forces groups are hard to document, however much information has been gathered on both the earliest and latest sets to see their use, with only an interim gap between the GRC-109/RS-1, RS-6, GRC-9, and the WW-II PRC-5.

The first and second radios to be developed for use by any US Elite Force were the PRC-1, and PRC-5. Both Classic Suite Case type radios, the PRC-1 arrived early in WW-II and is responsible for being the backbone of both tactical, and clandestine communication in the China Burma theater, not only by groups such as "Galahad, and "Merill's Marauders", but also the OSS Special Operations Group 101. Not the SSTR-1 which has received the credit for this activity. The PRC-5 arrived about mid-war, and while its exploits are not documented at all, evidenced does exist to place it too in the China/Burma Theater.

The BC-611 (SCR-536) was also originally designed expressly for use by Airborne troops. But as we know, it was later used by virtually every service, and every Allied country, in every theater of WW-II.

The third known radio to have been designed expressly for Special (Elite) Forces was the BC-1306 (SCR-694C). Being originally designed for use by Airborne and Mountain troops, it was later pressed into service with all branches of service due to the major shortcomings of the BC-654 (SCR-284). The SCR-284 shortcomings were indeed so great, that semi-experimental versions of the SCR-694 were placed into early service, the BC-1136 (SCR-694AW).

At the same time SCR-694 became available, so too did the TRC-2. Originally intended for service with Military Intelligence, this was a combination of the a standard BC-1306 with it's lower frequency twin, the RT-12/TRC-2.

Next came the already described TRC-7 also intended for use by airborne troops, followed closely by the TRC-10. The later was a re-packaged version of the PRC-1, which allowed for a far more versatile operational package. At a glance, it was similar in appearance to the SCR-284 but boasted a much wider frequency coverage, and CW only operation. This radio today remains one of the rarest, and most difficult to document of all military radios.

Somewhere in this mess came the PRC-4, about this radio we know nothing excepting that it was a discized version of the SCR-536/BC-611, also intended for use by Military Intelligence.

The Army was not the only military organization to employ specialized radio equipment for its Elite forces; the Navy too had such equipment even in the early days. However due to the typical secrecy veil that shrouded all Naval equipment, documentation of these types is the most difficult of all. Only two radios are known to have seen service with these type forces. The first was the common TBX whose exploits are only now beginning to surface. The second, also of WW-II vintage was the MBM. A suitcase-like radio set design for use by forward raiding parties. It should be noted that the Navy maintained clandestine operations in all Pacific theaters that were rivaled by no other organization foreign or domestic. And lest we forget the vulnerable MAB, or as it is called in it's own manual "the Para-Talkie", being pictured in used by a Para-Marine (though it is unknown whether the radio saw any use with this short lived branch of the Marine Corps). Post-War years saw the Army Special Forces using the CIA's RS-1, and the GRC-9. It was not until late 1962 that the RS-1 would be officially adopted as the GRC-109 and a regular Army Standard Issue item. And then only because of the transfer of operational control of the Army Special Forces from CIA hands back to regular Army. Contrary to popular belief, the GRC-109"A" model was not an adaptation for code burst operation. It was in fact the same radio supplied with a different "Armor" cabinet that was more than twice as thick as the previous model, with a corresponding increase in weight. By the time of the demise of the RS-1/GRC-109 they had nearly all been either supplied from the factory with code burst capabilities, or this feature was added by way of an MWO [Modification Work Order].

Following closely the adoption of the GRC-109 came the PRC-64 in 1965. Again a radio of CIA origin via the Delco 5300. While the widespread use of the PRC-64 in US hands may or may not have been short lived, and is open for debate, it did enjoy extreme popularity in the hands of one of our few Vietnam Conflict Allies, the Australians and their Special Operations Group. With the introduction of the "A" model with enhanced code burst operation, it would appear that all or most previous, models where modified to comply to the newer radio's specs in the same is respect as it's predecessors the RS-1, and GRC-109.

But before this, with its beginnings in question (approx early 60's/late 50's) came the semi-experimental TRC-77. Receiving its TRC designation via WW-II tradition, it too was originally intend for use by Military Intelligence, and Special Forces. However by this time, its intended US constituency had become highly disillusioned with any high tech/new fangled contraptions. It was then relegated to use by South Vietnamese commandos who were extremely active against North Vietnamese coastal installations. We have also recently learned, via this group, of possible Australian use.

The PRC-62, while for some years it was in question whether this radio actually existed, and the few surviving references to it were simple type errors or just wishful thinking. Recent events, again via this forum and our Aussie members have proven not only the existence of this radio, but also it's use by both the US and Australian militaries.

The author makes mention of the PRC-52, and PRC-42. Both of these are new ones to me, and I'm most interested to learn more about them. In the mid 60's to early 70's, a long list of SSB radios were acquired for testing in South East Asia (over 200). Tracing them down has been close to impossible. Every day somebody comes up with another possible candidate. Suffice to say that there were many radios acquired and used by every involved service. Some to the extent they received almost Standard type acceptance. Some familiar names include AVCO, Hughes, Southcom, Hallicrafters, Harris (RF), Motorola, Collins any others.

It should be noted that the use of HF communications equipment by Special Forces tactical units was primarily NOT to provide "very long distance communications", as the layman might understand it. While radios of this type were capable of long range communications when in competent hands, the primary mission of an HF portable in the hands of any front line tactical unit was to provide communications at ranges not possible with VHF FM equipment of the same type. I/E 1-5 miles for VHF/FM types, 5-10 miles for the HF types. These distances generally represent those that the unit in question might be separated from either its next higher Echelon, or companion units. Typical extremely long rang communications with this type equipment in Vietnam were on the order of 20 miles max.

Off-The-Shelf-Security-Radios,

Unfortunately, the author at the time of his writing this article was not privy to this group or its archives. The story of these "Off the Shelf PRCs" was told in an in depth multi part series by that title, again via this forum, and is still available from our back issues. There are also numerous other articles related to the topics in this series available from our archives.

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The proceeding is an update to a series of articles originally appearing in the "Military Collector Group Post"; an international email magazine dedicated to the preservation of history and the equipment that made it. Unlimited circulation of this material is authorized so long as the proper credits to the original authors, and publisher or this group is included. For more information concerning this group or membership, contact Dennis Starks at, <military-radio-guy@juno.com>.

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